Conservation of power By Wireless Communication in Street lights

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Abstract- *Power wastage is one of the most serious problems at the present. One of the major challenges at moment is the improvement of the street lighting system. To control and maintain complex street lighting system more economically and efficiently various street light control systems are now developed. The advancement in the technologies related to wireless communication has led to several engineering designs to aid the human requirements. Monitoring of street lights and controlling, plays a significant role in developing country like India and implementing the mobile communication for facilitating electricity board is basic idea of proposed work. In this paper we are proposing a simpler, multipurpose, efficient, cost-effective design to control the on-off mechanism of street lights via Short Message Service (SMS).*

Keywords- SMS, GSM, Streetlights, Power, Microcontroller.

I. INTRODUCTION

A well-designed, street lighting system should permit vehicles /pedestrians to travel at the night with good visibility, in safety and comfort, while reducing many malfunctions that occur during night and enhance appearance of neighborhood. Street lightning is poorly designed and inadequately maintained (e.g., there are large numbers of burned-out lamps), and uses older lighting technology, thus consuming large amounts of energy and financial resources (due to street lights glowing during the day time), while often failing to provide reliable lighting system. Providing street lighting is one of the most important responsibilities of a city. Street lighting is particularly a critical concern for public authorities in developing countries because of its strategic importance for the economic stability. The proposed plan for street light monitoring and control system will provide automated street lightning maintenance. In addition there are a number of improvements in street lightning system which will improve the safety conditions and maintenance of both vehicle traffic and the pedestrians. This application is thus designed in such a way that light sensors are placed in all the street lights circuit design which will be enabled to switch on and off automatically. Once the lights are switched on, then the current sensors which are placed at every pole circuit will be responsible to report the required problem status to the main station with the help of the GSM module attached with the circuit. With the status available in the centralized station, the centralized person can locate the faulty light for further repair hence reducing the time to search it and repair.

II. RELATED WORK

The hardware design of the street light control system designed by using Zigbee communication protocol which is described in [1]. As data communication protocol between centralized control center and the concentrator, Code Division Multiple Access (CDMA) protocol is used. The concept of a double layer capacitor based hybrid power train for light rail vehicles and city bus is presented in [2]. The simulations of the hybrid power train and first practical test-bench results which have been recorded from a prototype inverter made for integration into a diesel electric bus are also presented in [2]. A new design of the high power factor low cost electronic ballast with intelligent energy saving control for water treatment system ultra-violet lamps (UVL) drive is described in [3] to obtain truly pure drinking water. High power factor electronic ballast that will provide with intelligent energy saving control design for ultraviolet lamps drive of water treatment system proposed in [3], which will not only save the energy and manufacturing costs but will also guarantee with 100% safe and drinkable water quality. The phase-one results of a case study of a dimmable road lighting system with intelligent remote control presented in [4]. This is the first large scale installation of such a system for about 8000 street lamps in China and phase one of the project involves 1350 lamps. The electromagnetic compatibility of the road traffic control equipment and LRT, focus on the Manchester Metro link as the first of the new light rail systems to include on-street running is examined in [5]. A practical graphic control system is accomplished in [6] via PDA, wireless device server, PLC, driver, and servomotor. This system large consumer of energy for the cities, using up to 40 percent of a city's energy budget. Street lighting control system based on power line communication on demand market is described in [7].Remote control equipment for the monitoring and managing a street lighting system is presented in [8]. It is composed by the local control, realized by the

master boards located inside the electrical panels and slave boards mounted on each lamppost system, and by a remote control realized by a central unit for remote communication with the local control system.

III. METHODOLOGY

The block diagram of the proposed Power Saving Mechanism or street lights using wireless communication is shown in Fig1.It consists of power supply unit, GSM modem, RS232 (optional), microcontroller with in-built memory and a load. The main components used for power supply circuit is 1 Transformer, 2 Diodes, 1000uF Filter Capacitor, LM7805 3 PIN Voltage Regulator.

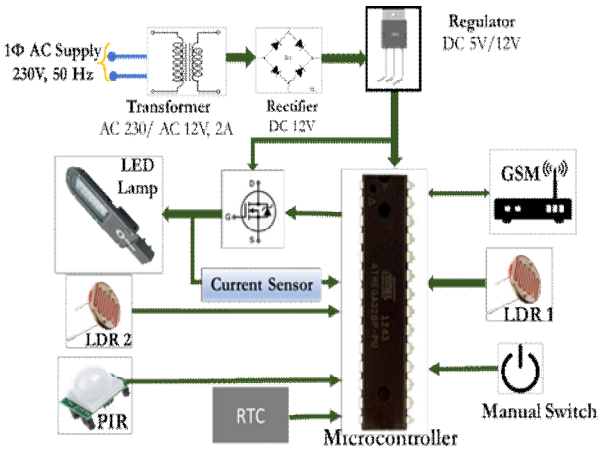

Figure 1. Basic Block Diagram

The basic block diagram gives the simple working of the system. It is the receiver side of the GSM based street-light control system. The GSM modem uses the regulated voltage of 5V which is generated by the power supply circuit. The 230V 50 Hz AC supply from the main electric line supply is used to feed the power supply circuit to generate 5V regulated supply for energizing the microcontroller and GSM modem. The power supply circuit consists of a step down transformer, Rectifier made of bridge rectifier circuit and filter circuit which provides a regulated 5V supply. Regulator is used to regulate the output from the transformer to the required voltage level. In a typical steps down transformer with a bridge rectifier and a filter the output. Voltage is unregulated 12V DC, if the desired output voltage is 5V then a required regulator needs to be used. 7805 regulator indicates the positive voltage with 5 volts as the output. The SMS message is sent by the authenticated operator of the electricity board is received by Subscriber Identification Module (SIM) inserted in the GSM module. The message is sent in the text format which received and extracted and fed to the microcontroller. The microcontroller uses the SMS received by GSM modem and switches the street-light ON/OFF. The microcontroller has in-built memory which is used to store the code which in turn controls load. The microcontroller used in the receiver side helps in decoding AT commands and taking the decisions. The load which is street-light in our project is connected to the microcontroller. Using the solid state relay, we switch ON/OFF the street-light. The solid state relay which accepts the triggering of voltage from microcontroller is separated from the 230V 50Hz. The power electronic devices are used to implement the solid state relay. The street-light is embedded with photodiode to achieve the feedback. The photodiode produces voltage according to intensity of the street-light and inform the microcontroller if the light is ON/OFF.

The benefits of this setup will include:

- Flexibility in the control by the use of a microcontroller.
- Global coverage through the use of the GSM network.
- Efficient and cheap means of communication.

The comprehensive approach helped in implementing project in a successful way. The basic block diagram played an important role in building the project completely and to provide a basic understanding of working of the system. The blocks in the diagram are implemented in the circuit level. The various blocks mentioned in the block diagrams are explained in detail in later sections in the circuit level

IV. APPLICATION

- Corporate field.
- Street lights (KPTCL).
- Home power control system
- Institutions/Organization

V. SCOPE OF PROJECT

- The useful information is collected from the street light each day.This information is stored in a database and based on this particular information charts are derived.
- Chart comprises of information like, Power consumption, Total number of burning hours, and Total number of interruptions.
- Provides Wireless Communication.
- Can be deployed in any street light circuit.
- Reduces amount of power consumption.

VI. HARDWARE REQUIRED

- System Compactable with Visual Studio .Net 2010 [Windows Forms]
- Microcontroller [ATMEGA328P]
- Current Sensor

- Light Sensors [LDR]
- GSM Module [Sim900]

VII. SOFTWARE REQUIRED

- Arduino IED1.6.12
- Proteous 8.1

VIII. CONCLUSION

Street-lights are a large consumer of energy for cities, using up to 40% of a city's energy budget. If every city installed this particular proposed system then a lot of power can be saved, proposed system is a power saving mechanism for street lights using wireless communication. It is a low cost, remote controlling, efficient and monitoring of the street-lights. It turns out to be most reliable and time efficient way to switch ON/OFF the street-lights. Outcome of this work gives an insight to control and monitor any other electronic appliances. It provides an effective measure to save energy by preventing unnecessary wastage of electricity, caused due to manual switching or lighting of street-lights when it is not required. This concept can also be used for control lighting system of industries, college or university campus. The proposed system is also used for home security and automation.

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